

WHAT IS CLAIMED IS:

- 1 1. An isolated Smurf protein.
- 1 2. The Smurf protein of claim 1, which is human.
- 1 3. The Smurf protein of claim 1, which is a Smurf1.
- 1 4. The Smurf1 of claim 3 which has a mutation corresponding to
2 C710A.
- 1 5. The Smurf1 of claim 3, which comprises at least 10 contiguous
2 amino acid residues as depicted in a sequence of SEQ ID NO:2.
- 1 6. The Smurf1 of claim 3, which comprises an amino acid sequence as
2 depicted in SEQ ID NO:2.
- 1 7. The Smurf protein of claim 1, which is a Smurf2.
- 1 8. The Smurf2 of claim 7 which has a mutation corresponding to
2 C716A.
- 1 9. The Smurf2 protein of claim 7, which comprises at least 10
2 contiguous amino acid residues as depicted in SEQ ID NO:4.
- 1 10. The Smurf2 protein of claim 7, which comprises an amino acid
2 sequence as depicted in SEQ ID NO:4.
- 1 11. An isolated nucleic acid encoding the Smurf protein of claim 1.
- 1 12. The nucleic acid of claim 11, wherein the Smurf protein is a human
2 Smurf protein.

- 1 13. The nucleic acid of claim 11, wherein the Smurf protein is a
2 Smurf1.
- 1 14. The nucleic acid of claim 13 which has a mutation corresponding to
2 C710A.
- 1 15. The nucleic acid of claim 13, wherein the Smurf1 comprises at least
2 10 contiguous amino acid residues as depicted in a sequence of SEQ ID NO:2.
- 1 16. The nucleic acid of claim 13, wherein the Smurf1 comprises an
2 amino acid sequence as depicted in SEQ ID NO:2.
- 1 17. The nucleic acid of claim 16, which has a nucleotide sequence as
2 depicted in SEQ ID NO:1.
- 1 18. The nucleic acid of claim 11, wherein the Smurf protein is a
2 Smurf2.
- 1 19. The nucleic acid of claim 18 which has a mutation corresponding to
C716A.
- 1 20. The nucleic acid of claim 18, wherein the Smurf2 protein comprises
2 at least 10 contiguous amino acid residues as depicted in SEQ ID NO:4.
- 1 21. The nucleic acid of claim 18, wherein the Smurf2 protein comprises
2 an amino acid sequence as depicted in SEQ ID NO:4.
- 1 22. The nucleic acid of claim 18, which has a nucleotide sequence as
2 depicted in SEQ ID NO:3.
- 1 23. A vector comprising the nucleic acid of claim 11.
- 1 24. A host cell comprising the vector of claim 23.

1 25. A method for producing a Smurf protein, comprising growing the
2 host cell of claim 23 under conditions that permit expression of Smurf protein from the
3 vector.

 26. A method for producing a Smurf protein, comprising growing the
host cell of claim 24 under conditions that permit expression of Smurf protein from the
vector.

1 27. A transgenic non-human animal that expresses a human Smurf
2 protein.

1 28. A method for inhibiting a bone morphogenic protein or tumor
2 growth factor-beta activation pathway in a cell, which method comprises permitting the
3 cell to grow under conditions that permit expression of Smurf from the vector of claim 23
4 introduced into the cell.

 29. A method for inhibiting a bone morphogenic protein or tumor
growth factor-beta activation pathway in a cell, which method comprises permitting the
cell to grow under conditions that permit expression of Smurf from the vector of claim 24
introduced into the cell.

1 30. A method for promoting a bone morphogenic protein or tumor
2 growth factor-beta activation pathway in a cell, which method comprises suppressing
3 expression of endogenous Smurf in the cell.

1 31. A method of screening for a modulator of Smurf activity, which
2 method comprises detecting modulation of Smurf activity in the presence of a test
3 compound relative to Smurf activity in the absence of the test compound.

1 32. The method according to claim 31, wherein the Smurf activity is
2 ubiquitination of a Smad protein in a host cell.

1 33. The method according to claim 31, wherein the Smurf activity is
2 interaction of a Smurf WW domain with a PPXY domain of a Smad protein.

1 34. The method according to claim 33, wherein the test compound is
2 screened for the ability to inhibit the interaction.

1 35. An antibody that specifically binds to Smurf protein.

1 36. An oligonucleotide or nucleic acid that specifically hybridizes under
2 highly stringent conditions to a nucleic acid having a sequence encoding Smurf.